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PUBLICATION SELECTION BIAS IN THE SOURCES OF FINANCING THE ENTERPRISES RESEARCH? A META-REGRESSION ANALYSIS

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Publication selection bias in the sources of financing the enterprises research? A Meta-Regression Analysis

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Abstract

This article discusses the verification of the effect of publication in the studies regarding the sources of financing business operations. The studies related to the determinants of the use of bank loans, trade credits and lease were analysed. There is a probability that the results presented in literature may be encumbered by the problem of statistical significance selection (so-called: publication selection bias). The works which show a weaker correlation or a lack of significance are less attractive and are seldom published – they are viewed as not providing enough contribution to science and not explaining the studied phenomena.

Keywords:

financing sources, meta-regression analysis, publication selection bias, bank loan, trade credit, lease

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Introduction

One of the main factors determining the creation, survival and development of companies is the access to financing sources. Thanks to the sources of financing, the companies create jobs, implement projects, create added value, contributing to the economic growth and participate in the national budget. Access to external financing sources determines the ability of companies to perform these functions at various stages of their life. Enterprise finance theories usually do not provide a clear answer as to the determinants of capital structure (ratio of external sources of financing to own capital). In the early model of Miller and Modigliani (1958), with the assumption of an ideally competitive market with a rational entrepreneur, perfect access to information and lack of taxes, the value of the business and the capital cost were independent from the capital structure while the external capital was an ideal replacement of own capital.

According to the theories of the availability of financing sources as well as the changes in own capital due to the accumulation of generated profits or the need to cover the losses, the capital structure of companies is an outcome variable. Thus, the burden of the analysis performed in this article will be borne by the partial supplies and demands of bank loans, trade credits (effect of financial liquidity redistribution or access to bank loans) as well as financial lease (requiring lower collateral than loans) and operating lease (providing financing despite high indebtedness). The company pursues the most advantageous capital structure in the given conditions, with impact on the effectiveness of operational and investment decisions affecting the profits. The capital structure forms the value of the company and, in consequence, has significant impact on further business development.

The meta-analysis enables the collective analysis of the results of independent studies and a more precise assessment of the effect of the given independent variables on the analysed phenomenon. The conclusions of the meta-analysis help explain the discrepancies in the dependencies described by different researchers. Due to the fact that the empirical literature is very diverse as for the applied, often incorrect, estimation methods, the purpose of this article is the verification of the existence of the publication selection bias in the available literature on business financing sources. Heterogeneity and selection bias are examined jointly in meta-regressions containing moderator variables for econometric methodology, primary data, and precision of estimates. The works which show a weaker correlation or a lack of significance are less attractive and are seldom published – they are viewed as not providing enough contribution to science and not explaining the studied phenomena..

30 studies on the determinants of financing (EconLit and GoogleScholar) with bank loans, for which the dependent variables were constructed in a similar fashion were selected from the review of literature on business financing sources (over 130 articles). 119 regressions from 17 publications were used in the final phase of the meta-analysis. 35 of them devoted to financing with bank loans and trade credits were selected to construct a database containing information about the 303 estimated models. 227 econometric models devoted to the determinants of business financing with lease presented in 25 articles were analysed.

A meta-analysis of the literature regarding business operation financing with bank loans, trade credits and lease was performed. The study of the use of bank loans took into account the variables of profitability (e.g. Jiménez et al. 2009; Huyghebaert et al. 2007), assets structure (e.g.

Berrospide et al. 2012; Dewaelheyns and Van Hulle, 2007), company size (e.g. Demiroglu et al. 2012; Ghosh, 2010). Regarding the determinants of business financing with trade credit for the main groups of factors taken into account in empirical research: indebtedness (e.g. Marzec and Pawłowska, 2011), liquidity (e.g. Kestens et al. 2012), company size (e.g. Vaidya, 2011), profitability (e.g. Delanny and Weill, 2004), stock (e.g. Blasio, 2005) and development potential (e.g. Niskanen and Niskanen, 2006). In studies regarding the use of lease, the following variables were primarily included – profitability (e.g. Chu et al. 2008), liquidity (e.g. Beattie et al. 2000), indebtedness (e.g. Singh, 2011) and company size (e.g. Slotty, 2009).

1. Funnel graph and verification of the publication selection bias

Meta-analysis is a statistical method for the determination of the common denominator of the results of multiple similar studies of the same phenomenon (Stanley and Jarrell, 1989). The purpose of meta-analysis is the summary and explanation of differences in the regression results described by different researchers and the presentation of a summary statistical conclusion for them (Sauerbrei and Blettner, 2003). This approach was first described by Rosenthal in 1979, in the article *“Combining results of independent studies”* regarding the possibility of combining results from independently conducted studies. This approach was developed by Rosenthal and Rubin (1982), Hunter and Schmidt (1990) and resulted in the development of statistical methods for drawing a common conclusion based on statistical premises from multiple different studies.

There is a probability that the results obtained by the researchers may be affected by the problem of statistical significance selection (so-called: publication selection bias). The selection of publications occurs when the researchers and reviewers prefer the statistically significant results. The works which show a weak correlation or a lack of significance are less attractive and are seldom published – they are viewed as not providing enough contribution to science and not explaining the studied phenomena. The problem of publication selection is related to the overstating of the empirical effect of the discussed matter and causes an unimportant effect of a given variable to appear significant.¹ The arguments presented above support the need to perform the meta-analysis in order to summarise and compare the results of the adaptation rate parameter estimates by other authors as well as the investigation of the existence of the publication selection bias which may significantly influence the results obtained by researchers.

The funnel graph is a classic method used for the identification of the publication selection bias. It is a distribution diagram for the precision (measured as the inverse of the standard error) from the estimated coefficient. The precision can also be measured by sample size or its square root. In the case of the absence of the publication selection bias, the diagram should resemble an upside down funnel – wide at the base, tapering as the values on the vertical axis increase. The funnel diagram should also be symmetrical, regardless of the value of the true effect, at which the estimations should converge. The expected upside down funnel shape is determined by heteroscedasticity. The studies on small samples characterised by larger standard errors and the resulting lower precision are located on the bottom of the diagram which results in the more dispersed base of the chart. Asymmetry is the sign of the occurrence of publication selection bias. It is usually manifested by the imbalance of the chart to one side – proving the preference of the specific direction or value of the coefficient estimated by researchers.

¹ T.D. Stanley, *Beyond Publication Selection*, Journal of Economic Surveys, 19, 2005, p. 309-345.

In order to confirm the results on the chart, which are often a subjective assessment of the researcher, a simple statistical analysis was performed. The most popular method for modelling the publication selection bias is the Funnel Asymmetry Test (FAT). In addition, the regression was estimated using the Weighted Generalized Least Squares (GLS) method in the following form:

$$t_i = \beta_{SE} + \beta_e \left(\frac{1}{SE_i} \right) + v_i \quad (1)$$

where: t_i – t – distribution, SE_i – standard deviation, β_{SE}, β_e – unknown parameters, v_i – random error.

Testing whether the constant is equal to zero ($H_0: \beta_{SE} = 0$) is equivalent to the testing of distribution asymmetry and can be used as the measurement of the occurrence of the effect of the publication selection bias on the results referred to precision-effect test (PET) (Egger et al., 1997; Stanley, 2008; Stanley, Doucouliagos, 2012). Whereas, testing whether the β_e parameter is equal to zero ($H_0: \beta_e = 0$) shows the direction of the bias with the studied effect (Egger et al., 1997; Stanley, 2008).

Like in any regression model, the estimates of MRA's coefficients can become biased when important explanatory variables are omitted. MRA model (1) can be expanded to include variables, Z_k , that explain variation in estimates and other factors, and K_j , that are correlated with the publication selection process itself.

$$t_i = \beta_{SE} + \sum \gamma_j K_{ij} + \beta_e (1/SE_i) + \sum \alpha_k Z_{ik}/SE_i + v_i \quad (2)$$

where: K variables may affect the likelihood of being selected for publication. Z variables may affect the magnitude of the estimator.

2. Publication selection bias

2.1 Bank loan - verification of the publication selection bias

30 studies on the determinants of financing with bank loans, for which the dependent variables were constructed in a similar fashion were selected from the review of literature on business financing sources (over 130 articles). Finally, 119 regressions from 17 publications were selected for further analysis.

According to the theory of financing sources hierarchy, the businesses prefer internal over external financing because high profit enables the financing of investments with revenue. More profitable businesses can be treated as having higher credit standing because they show the capacity to cover and service future liabilities. Low profitability may results in the limited availability of bank loans. It is, therefore, reasonable to expect a positive impact of profitability on bank loans. However, the businesses may increase their indebtedness with banks in order to cover cash shortages resulting from low profitability. In this case, a negative correlation between the profitability and bank loan should be expected. The results of empirical studies do not clearly define the character of the correlation between profitability and bank loan financing – the examples of positive and negative correlation can be found with similar frequency. In empirical studies, the profitability was usually measured by the return on assets (ROA), return on equity

(ROE) and EBITDA for assets total. The ROA indicator had a negative impact on bank loans, for example in the following studies: Alonso et al. (2005), Dewaelheyns and Van Hulle (2007), Jiménez et al. (2009). Positive correlation was found in over a dozen models, with similar results for no significant correlation. For ROE, Bougheas et al. (2004) obtained negative impact on bank loan financing and for the EBITDA indicator, Huyghebaert et al. (2007) found positive impact. The theory of financing sources hierarchy predicts that profitable businesses, without limitation in access to external financing sources, as well as businesses from the industries with low fixed assets expenditure are relatively less indebted.

The collateral was usually measured as the ratio of fixed assets to assets total. Higher collateral improves access to long-term loans and limits the ratio of short-term loans in the total indebtedness. If the businesses use tangible fixed assets as collateral, they limit the cost of bank loans by the limitation of the problem of assets disclosure and substitution (e.g. Myers and Majluf, 1984; Detragiache, 1994; Boot et al. 1991; Leeth and Scott, 1989). The positive correlation between the collateral and bank loan were found by Huyghebaert et al. (2007), Dewaelheyns and Van Hulle (2007), Bougheas et al. (2004) and Berrospide et al. (2012). By the estimation of probit models for the specification of determinants of the use of bank loan and the Heckman model for the ratio of bank loan in the assets, Cole (2011) found that companies with less fixed assets do not use loans. The low application of bank loans despite the high ratio of fixed assets in the property of the company was shown by Jiménez et al. (2009 and 2013). Jiménez et al. (2013) showed that the businesses with more fixed assets or cash get less new loans and rely more on internal financing.

The decisions on granting loans to businesses with certain specifications differ depending on the interest rate. Collateral is less important during the credit market constriction. The balance channel of monetary policy impulses transmission is based on the fact that the changes of interest rates lead to the changes in the values of collateral offered as security by potential debtors. The loss of value may force the businesses to limit the investment expenditure because their credit standing becomes weaker (Bernanke and Gertler, 1995). The increase of interest rates results in the drop of share prices and reduction of the cash flow value. It also decreases the value of the asset to be used as collateral and thus may lead to lower credit supply. The amount of the loan taken by businesses may be limited by the value of owned assets used as payment security.

The correlation between the size of the company and bank loan financing is unclear. Large, diversified companies, well known external businesses with lower information asymmetry problems are associated with lower risk factors. Large businesses have more negotiation strength – used to build and maintain the relationship with the bank. Due to that, large companies which could replace bank financing with financing by debt issue, take bank loans for financing. It can be assumed that the size of the company as positive correlation with indebtedness, however the results of studies not always verify this hypothesis. The positive correlation between company size and financing by bank loan was found by Alonso et al. (2005), Dewaelheyns and Van Hulle (2007), Cole (2011), Jiménez et al. (2013), Demiroglu et al. (2012) and Berrospide et al. (2012) and low use of bank loans by large companies was reported by Ghosh (2010) and Jiménez et al. (2010 and 2012). Ghosh and Sensarma (2004). Based on the estimations of the probit model for the probability of declaration of need for bank loans, Brown

et al. (2012) showed that among the countries from Eastern Europe, smaller businesses are less likely to require bank loans for operations financing. The impact of company size is less visible in Western Europe.

The diversity of the applied independent variables and the diverse size of data sets result in the fact that during results generalisation it is inevitable to limit the meta-analysis to the variables measured in the same way in empirical studies from the literature. This is the reason why the meta-analysis takes into account model estimation results only from the studies which included profitability measured by ROA, collateral reflected in the assets structure (set as the ratio of fixed assets in the property) and size of the company measured with a natural logarithm of total assets (Table 2) in the list of determinants of business financing with bank loans. The most common method for the verification of the meta-analysis in relation the selection of publications with empirical research results is the analysis of the chart presenting the relation between parameter estimations (*estimation effect*) and the inverse of the standard deviation (*precision*) (Charts 1, 3, 5).

In all cases, the publications to date obtained positive, negative and insignificant estimations. The lack of publication selection is evident when the estimated parameters change randomly and symmetrically around the “true” population effect.

Based on the graphical analysis, chart 1 shows no publication selection, whereas charts 3 and 5 contain publication selection. The obtained results indicate the existence of the publication selection bias in the analysed empirical literature. It is worth noting that man econometric decisions, such as omission of variables, selection of the estimation method or functional form can also change the shape of the chart. However, the discussed sources of variance may be described as bias related to wrong model specification. Furthermore, the heterogeneity of the “true effect” between the studies, caused by the application of different sets of data for different times and countries may be the reason for the asymmetry in the funnel chart, even in the case of the lack of publication selection bias.

In chart 1, the top point approaches a value near 0. If the results obtained by the researchers are not biased, they should spread symmetrically around this point. The mean of all profitability estimations is -0.03, so it is close to the top chart value. In the case of chart 3, the top point approaches the value near 0 and the mean of all assets structure estimations is 2.7 – far more than the top chart value. In chart 5, the top chart value is -0.2 and the mean of all estimates for company size is lower – -0.6.

Charts 2, 4 and 6 illustrate how the parameter estimations changed in time. One can see that the impact of assets profitability on bank loan financing grows in time (Chart 2).

There is no clear correlation visible for the assets structure (Chart 4), while negative correlation has been mostly found for company size in recent years (Chart 6), which – together – indicate the growing interest in bank loan financing among smaller businesses, often without assets to be used as collateral.

In order to confirm the results on the chart, which are often a subjective assessment of the researcher, the regression described by formula (1) was estimated. The asymmetry of distribution ($H_0: \beta_{SE} = 0$) was tested. Discarding the null hypothesis means the occurrence of the effect of the publication selection bias on the results (Egger et al., 1997; Stanley, 2008). Testing

whether the β_e parameter is equal to zero ($H_0: \beta_e = 0$) shows the direction of the bias with the studied effect (Egger et al., 1997; Stanley, 2008).

In the case of profitability investigation, there were no grounds to discard the null hypotheses, both hypotheses were discarded for assets structure and for company size, the hypotheses about zero β_e was discarded (Table 3 – *publication selection bias*). Adding moderator variables to Eq. (1) yields a weighted least-squares meta-regression model of heterogeneity and publication bias. Potential explanatory variables for meta-regression analysis were included in Table 10. The intercepts in regressions for profitability, assets structure, company size are significant. Precision coefficients in regressions for assets structure, company size are significant (Table 3 – *publication selection bias + heterogeneity*). This analysis with of heterogeneity and publication bias would provide a more acceptable test for publication bias and also inform on the underlying empirical effects.

In summary, the results of the meta-analysis show the occurrence of the publication selection bias in the case of the profitability, structure of the assets and size of the company.

2.2 Trade credit - verification of the publication selection bias

The meta-analysis was based on the review of empirical literature regarding the determinants of financing business operations with a trade credit. Based on the collection of over 130 articles on the sources of business financing, 35 devoted to trade credit financing were selected to build a database with information regarding the estimated models. Finally, 303 regressions from 25 publications were selected for further analysis.

The research results are not compatible regarding the character of the relationship between the trade credit and bank loan. For companies in Poland, Zawadzka (2009) pointed out their complementarity, while Marzec and Pawłowska (2011) – substitutability. Couppey-Soubeyran i Hericourt (2011) showed the substitutability of the bank loan and trade credit in Middle East and North Africa, which intensifies when the access to financing by financial institutions is limited. In Japan, Ono (2010) obtained complementarity and expected that the monetary policy affecting financial institutions will influence the level of liabilities and trade receivables.

It can be assumed that the use of trade credit may help the businesses to overcome liquidity problems. Despite the fact that net trade credit does not directly affect stock, the coverage ratio stops impacting the stock of companies with limited access to credits which increase the financing with trade credit. This is the reason why the strong trade credit market in England was capable of weakening the effects of the restrictive monetary policy and partially alleviate the recessions following such restrictions (Guariglia and Mateut, 2006). In the monetary restrictions period, the traditional indicators of financial liquidity of the company lose their significance compared to trade credit. Businesses with large ratio of intangible assets which cannot be used as additional credit collateral experience limitations in liquidity as well as trade credit rationing in strict monetary policy periods. The conditions of trade credits, however, are subject to little change in time (Blasio, 2005). Thus, the researchers expected the low level of liquidity to increase the probability of experiencing the limitations in access to bank loans and increase the demand for trade credits. However, Table 5 shows that the researchers obtained

both positive correlation (e.g. Zawadzka, 2009; Kestens et al. 2012), and negative correlation (e.g. Huang et al. 2011; Marzec i Pawłowska, 2011) between the liquidity and the use of trade credit.

The size of the company, on the one hand may be the measure of reputation of the company – larger companies are seen as more risk-free. Due to this fact, one may expect a positive correlation between the short-term liabilities and the size of the company. On the other hand, larger companies should have better access to bank loans. If, therefore, the substitution between the bank loan and trade credit exists, the impact of the size of the company on short-term liabilities should be negative. Vaidya (2011) directly assumes the size of the company to determine its credit standing and Zawadzka (2009), after selecting sales value as company size measurement, suggests that the variable is related to the profitability of liquid assets and transaction costs of their liquidation. The higher the sales revenue, the higher the need for financing own stock with trade credit. Berger et al. (2005) pointed out that the differences in company sizes impact the whole bank–company relationship and the availability of bank loan, smaller companies usually have their access to loans more limited compared to large companies.

For the suppliers of trade credit, higher company profitability reduces risk, which would suggest a positive correlation between profitability and short-term liabilities. However, higher profitability is also a positive signal for the bank and is reflected in increased availability. If, therefore, the substitution between the bank loan and trade credit exists, the impact of the profitability on short-term liabilities should be negative (Delanny and Weill, 2004). Low profitability increases the probability of experiencing restrictions in the access to bank loans. In the situation when companies use trade credits for the purpose of price discrimination, only companies with limited access to bank loans will extend their trade credits.

The information about stock rotation gives the suppliers an information advantage over the banks in the assessment of the credit standing of young companies. The suppliers have financial advantage over banks because the stock is more valuable to them if the ratio of raw materials is high, resulting in the possibility of taking over the unpaid deliveries and selling them further. High ratio of finished products in stock reduces the supplier's benefits from the liquidation of the debtors' assets by the takeover and sale of delivered goods, because the purchaser transformed the supplied raw materials into finished products. In this situation both the banks and suppliers can experience the same difficulties in the sale of the finished products. This is the reason why the liabilities of companies with high ratio of finished products in total stock are lower (Petersen and Rajan, 1997). The higher the stock rotation, the higher the demand for trade credit (Zawadzka, 2009). The increase in the value of the stock, sales revenue and liquidity increases the demand for trade credit. In response to the monetary restrictions, the stock of companies depending on banks which experience liquidity problems and an insufficient trade credit will decrease more than the stock of companies with wide access to trade credit (Blasio, 2005). Stock is one of the more flexible parts of company assets, providing potential liquidity to balance the shocks in access to external financing sources.

The studies have also taken into account the development potential, expecting that the high level thereof is appreciated by banks and suppliers and is positively correlated with the size of offered credits and loans. However, the impact of development potential on short-term liabilities depends on the relation between the bank loan and trade credit (complementarity vs. substitutability).

Due to the diversity of the variables used by researchers and the sizes of data sets, the econometric analysis of research results was attempted to generalise on the conclusions in the global scale.

Table 5 summarises the impact of the following groups of variables included in the meta-analysis: indebtedness, liquidity, company size, profitability, stock and development potential on company financing with trade credit.

In all cases, the publications to date obtained positive, negative and insignificant estimations. The lack of publication selection is evident when the estimated parameters change randomly and symmetrically around the “true” population effect. The population selection bias effect was analysed based on the following charts. Charts 7, 15, 17 clearly confirm population selection.

In chart 7, the top point approaches a value near 0. If the results obtained by the researchers are not biased, they should spread symmetrically around this point. The mean of all indebtedness estimations is 0.1, so it is close to the top chart value. In the case of chart 9, the top point approaches the value near 0 and the mean of all fluidity estimations is -0.3 – less than the top chart value. In chart 11, the top chart value is -0.1 and the mean of all estimates for company size is positive and equal to 0.1. In chart 13, the top point approaches a value near 0. The mean of all company size estimations is 0.1, so it is close to the top chart value. In the case of chart 15, the top point approaches the value near 0 and the mean of all development potential estimations is -0.5 – far less than the top chart value. The mean of the estimations for stock impact analysis equals 0.1 and is slightly higher than the top point of chart 17.

Based on the results for model estimations of heterogeneity and publication bias presented in Table 6, the population selection bias was pointed out in the case of indebtedness, profitability and growth opportunities.

2.3 Lease – verification of the publication selection bias

The meta-analysis was based on the extensive review of empirical literature regarding the determinants of financing business operations with lease. 27 studies on the determinants of financing with lease, for which the dependent variables were constructed in a similar fashion were selected from the review of literature on business financing sources (over 130 articles). In the final phase, 227 estimated econometric models presented in 25 articles were analysed.

The sets of dependent variables included in individual studies on lease are very varied. There is a group of main factors, resulting from the theory, which were tried to be included in most analyses due to the risk of omitted variable bias. The studies concentrated on the determination of the effect of indebtedness, profitability, liquidity, development potential and company size. In several cases, the authors pointed out the limitations resulting from the lack of appropriate data. In the context of lease analysis, we observe more studies referring to tax issues. Neuberger and R  thke-D  ppner (2012) also included a number of variables reflecting the characteristics of the company owner or manager.

According to the finance theory, the correlation between the debt and lease is negative, which indicates the possibility of replacing credit standing with lease (Singh, 2011). If the lease is a substitute of financing with debt, it could be expected that the lessees provide a smaller

leverage compared to companies not using lease. According to the *trade-off* theory, businesses approach the level of indebtedness at which the benefits of the debt are equal to its cost. The solvency of the company can be described as the level of debt which the company can service. According to Ang and Peterson (1984), operating lease may be an alternative source of financing in case the companies reach the end of their solvency. According to the *trade-off* theory of capital structure, lease is a substitute of debt because the limit cost of new debt or new lease *increases with fixed claim obligations in place* (Yan, 2006). Therefore, the increase of the leverage should lead to the compensating reduction of lease use. However, several studies found debt and lease to be complementary (e.g. Ang and Peterson, 1984; Branson, 1995; Callimaci et al. 2011). More non-lease indebtedness is correlated with higher lease. The cause for the correlation suggested by Ang and Peterson (1984) is the lack of effectiveness on the debt and claims market. Callimaci et al. (2011) emphasise that the complementary correlation between lease and debt does not preclude the companies with high credit standing from using bank loan and lease. The companies can, in some cases, pay attention to the non-financial aspects of the lease agreement, such as its short-term nature. Companies with high leverage can maximise the advantages of debt and increase the use of lease. It is also possible that companies with high leverage have exceeded or are close to exceeding their credit standing and choose lease for additional needs. The relationship between credit and lease was also investigated by Deloof et al. (2007). The authors suggest that the discrepancies between the theoretical predictions of substitutability of lease and debt and the empirical results confirming complementarity (so-called *lease puzzle*) are related to the higher advantages of lease compared to debt. This relationship can, therefore, change depending on the researched country and legal regulations, especially tax regulations, applicable in the country.

According to the theory of financing sources hierarchy (Myers and Majluf, 1984), the lack of internal funds forces the companies to use external resources via debt or capital financing. However, due to the high cost of external financing, companies with less available funds can choose operating lease as alternative financing source. The most commonly used measure of internal funds availability was cash reserve and *cash flow* with both positive and negative effect on the lease. In many studies, the variable reflecting the liquidity of the company proved insignificant for the use of lease.

Sharpe and Nguyen (1995) suggest that large companies have easier access to external capital markets and are less interested in the operating lease. Slotty (2009) points out that companies with financial limitations are more likely to use the lease in order to alleviate the information asymmetry issue. The company size was one of the *proxy* variables used for financial limitation. Large businesses are less susceptible to the information asymmetry problem (Yan, 2006). Large companies are more likely to finance their operations with debt because they are more diversified, have more stable cash flows and can easily use the effect of scale in external financing, while smaller companies may consider external financing to be too costly and are more likely to choose the lease (Singh, 2011). Grinblatt and Titman (1998) claim that the 'creditor-debtor' conflict may be more severe for small companies. Small companies are more flexible and able to increase the risk of investment projects. The potentially higher return on the increased risk will only be felt by the shareholders, while the increased risk will affect the creditors – this reduces the will of creditors to finance such investments. Furthermore, head

managers in small companies are often majority shareholders and may prefer lower personal risk related to lower indebtedness. These arguments favour lower indebtedness ratio in small companies. It can also be expected that the small companies prefer the lease over debt because the creditors gain better security and the manager with large interest in the capital may prefer the lease in order to limit personal risk related to the aging of fixed assets or risk related to the specific assets (Beattie et al. 2000). In light of the above, the studies were expected to find negative correlation between the size of the company and lease. The results, however, show a various impact of company size on the use of lease in relation to other forms of operational financing. Some, e.g. Chigurupati and Hegde (2009), Neuberger and R  thke-D  ppner (2012), pointed out the non-linear dependency, according to which the use of lease decreases to the point of certain company size and then decreases with the increase of company size. The applied measures of company size were: total assets, sales level or number of employees.

The characteristics of current and future company assets impact the financing sources. Slotty (2009) using an indicator measuring the relation between share prices and profit per share and Beattie et al. (2000), based on the increased sales revenue, point out that companies with greater development potential will choose the lease more often for a given financing requirement level. Singh (2011), measuring the company development potential as the relation of the market value of assets to the book value of assets arrived at negative effect on the lease. Older research shows a statistically insignificant correlation in many regressions (Ang and Peterson, 1984; Branson, 1995).

The effect of the profitability of the company on financing by lease was relatively often taken into account in the studies. According to the *pecking order* theory, businesses with high profitability indexes and low development potential require less external financing. The researchers pointed out mostly the negative (e.g. Chigurupati and Hegde, 2009; Robicheaux et al. 2008) effect of profitability on lease financing. The less profitable companies use the lease to a larger degree, according to the *contracting cost* theory. An insignificant (Chu et al. 2008) and sometimes positive (Beattie et al. 2000) correlation between profitability and lease financing were also obtained.

Tax aspects can also impact business decisions regarding the capital structure. The theories of optimal capital structure based on taxes predict a negative correlation between the lease and the limit tax rate for the company. The negative correspondence of the tax variable and the broadly defined lease measure can be expected, however no specific correlation with the capital market was predicted. The lease enables the sales of tax reliefs (amounts deducted from taxable income) of the lessor in return for lower lease fees, which the studies have not been able to confirm. Graham et al. (1998) suggests that this failure refutes the fact that the status of corporate income tax is endogenous in relation to the decisions regarding financing and, based on studies, confirms the negative correlation between the operating lease and tax rates. The authors claim that the companies which generate tax loss use lease financing as a tool for tax benefits (the lease provides personalised financing with a tax advantage, potentially one of its kind). If the lessee cannot use the depreciation and interest cost deduction from the corporate income tax due to high operational loss and/or other tax reliefs, they may take partial advantage of tax incentives related to the purchase of assets via assets lease (Lasfer and Levis, 1998). Duke

et al.(2002) confirm the significance of the effective tax rate, proving that leasing is chosen due to tax benefits.

Interesting results are provided by studies on the subgroups of companies selected, for example, due to size or based on interaction models. In the case of large companies, leasing seems to be selected as a source of financing due to its tax benefits. Large businesses using leasing are more profitable than the remaining large companies. For large companies, lease and credit are complementary (Lasfer and Levis, 1998). Focusing on the factors determining the choice of lease for companies where the leading creditor has a stronger incentive to monitor, it was found that smaller companies, businesses generating loss and companies which do not pay dividend are more likely to choose lease financing. These results show that companies facing financing limitation are more likely to choose the lease (Beatty et al. 2010).

Based on the analysis, groups of variables particularly significant for this study were selected for further meta-analysis (Table 8).

In all cases, the publications to date obtained positive, negative and insignificant estimations. Chart 28 shows that the estimates of parameters measuring the impact of company size on lease financing have been negative in recent years, contrary to the estimates from previous years. Charts 19, 25 and 27 show publication selection bias.

In chart 19, the top point approaches a value near 0. If the results obtained by the researchers are not biased, they should spread symmetrically around this point. The mean of all indebtedness estimations is 0. In the case of chart 21, the top point approaches the value of -0.01 and the mean of all liquidity estimations is also -0.01. In chart 23, the top chart value is -0.01 and the mean of all estimates for tax is positive and equal to 0.1. In chart 25, the top point approaches a value near 0. The mean of all profitability estimations is -0.14, so it is lower than the top chart value. In the case of chart 27, the top point approaches the value of 0.001 and the mean of all company size estimations is also -0.01.

Table 9 contains the estimations of model of heterogeneity and publication bias. In the studies of lease, the population selection bias was confirmed in the case of indebtedness, profitability, liquidity, tax and size of the company. The bias direction in the case of indebtedness, profitability and size of the company is positive (significant and positive estimators of parameter β_e).

One of the reasons can be wrong model specification. In order to estimate the studied phenomenon, the authors select various methods of estimation, often incorrect. Another reason for the observed bias may be pressure for obtaining a statistically significant adaptation rate factor. Furthermore, the studies used in the meta-analysis involve different sample sizes, different timeframes which may have also influences the shape of the chart.

Conclusion

This article discusses the verification of the effect of publication in the studies regarding the sources of financing business operations, such as bank loans, trade credits and lease. There is a probability that the results obtained by the researchers may be affected by the problem of statistical significance selection (so-called: publication selection bias). The described study is the continuation and summary of the previous meta-analyses of the authors (Białek-Jaworska, Dzik-Walczak, Nehrebecka, 2015). The meta-analysis enables a more precise assessment of the effect

of the given independent variables on the analysed phenomenon. The conclusions of the meta-analysis help explain the discrepancies in the dependencies described by different researchers. Due to the fact that the empirical literature is very diverse as for the applied, often incorrect, estimation methods, the purpose of this article is the verification of the existence of the publication selection bias in the available literature on business financing sources. The works which show a weaker correlation or a lack of significance are less attractive and are seldom published – they are viewed as not providing enough contribution to science and not explaining the studied phenomena.

In the publications regarding bank loans, the publication selection bias was found in the case of the structure of the assets, profitability and size of the company. In the case of the trade credit, the publication selection bias was pointed out in the case of indebtedness, profitability and growth opportunities. In the studies of lease, the publication selection bias was confirmed in the case of indebtedness, profitability liquidity, tax and size of the company.

Bibliography

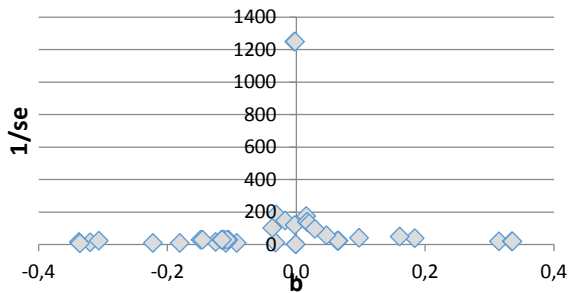
- Alonso P.D.A., Iturriaga F.J.L., Sanz J.A.R., Vallelado Gonzalez E. (2005), *Determinants of Bank Debt in a Continental Financial System: Evidence from Spanish Companies*, *The Financial Review*, 40(3), pp. 305-333.
- Ang J., Peterson P. (1984), *The Leasing Puzzle*, *The Journal of Finance*, 39(4), pp. 1055-1065.
- Atanasova Ch. (2007), *Access to Institutional Finance and the Use of Trade Credit*, *Financial Management*, pp. 49-67.
- Atanasova C., N. Wilson (2003), *Bank Borrowing Constraints and the Demand for Trade Credit: Evidence from Panel Data*, *Managerial & Decision Economics*, 24(6/7)
- Beattie V., Goodacre A., Thomson S. (2000), *Operating leases and the assessment of lease – debt substitutability*, *Journal of Banking and Finance* 24, pp. 427-470.
- Beatty A., Liao S., Weber J. (2010), *Financial Reporting Quality, Private Information, Monitoring, and the Lease-versus-Buy Decision*, *The Accounting Review* American Accounting Association, Vol. 85, No. 4 DOI: 10.2308/accr.2010.85.4.1215, pp. 1215–1238.
- Berger A.N., Cowan A.M., Frame W.S. (2011), *The surprising use of credit scoring in small business lending by community banks and the attendant Effects on credit availability, risk, and profitability*, *Journal of Financial Services Research* 39, pp. 1-17.
- Bernanke B.S., Gertler M. (1995), *Inside the black box: the credit channel of monetary policy transmission* (No. w5146), National bureau of economic research.
- Berrospeide J., Meisenzahl R., Sullivan B. (2012), *Credit Line Use and Availability in the Financial Crisis: The Importance of Hedging*, Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington.
- Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Determinanty finansowania działalności przedsiębiorstw kredytem bankowym: meta-analiza*, *Bank i Kredyt*, 46 (3), pp. 253 – 298.
- Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Transakcyjne i finansowe motywy wykorzystania kredytu handlowego: meta-analiza*, *Wiadomości Statystyczne*, 7.
- Białek-Jaworska A., Dzik-Walczak A., Nehrebecka N. (2015), *Kiedy firmy sięgają po leasing?*, *Gospodarka Narodowa*, 2
- Blasio G. (2005), *Does Trade Credit Substitute Bank Credit? Evidence from Firm-level Data*, *Economic notes*, 34(1), pp. 85-112.
- Boguszewski P., Kocięcki A. (2000), *Wpływ polityki pieniężnej na zachowania przedsiębiorstw w świetle danych GUS i badań ankietowych – wybrane zagadnienia*, *Bank i Kredyt*.
- Boot A., Thakor A., Udell G. (1991), *Secured lending and default risk: equilibrium analysis and policy implications and empirical results*, *Economic Journal* 101, pp. 458-472.
- Bougheas S., Mateut S., Mizen P. (2009), *Corporate trade credit and inventories: New evidence of a trade-off from accounts payable and receivable*, *Journal of Banking and Finance* 33, pp. 300-307.
- Bougheas S., Mizen P., Yalcin C. (2004), *Access to external finance: theory and evidence on the impact of firm-specific characteristics*, *The Central Bank of the Republic of Turkey, Research Department Working Paper No: 04/06*.
- Branson B.C. (1995), *An empirical reexamination of the leasing puzzle*, *Quarterly Journal of Business and Economics*, 34(3).
- Brown M., Kirschenmann K., Ongena S. (2010), *Foreign Currency Loans - Demand or Supply Driven?* Swiss National Bank.
- Brown M., Ongena S., Popov A., Yesin P. (2012), *Who needs credit and who gets credit in Eastern Europe?* European Central Bank Working Paper Series No 1421.
- Callimaci A., Fortin A., Landry S. (2011), *Determinants of leasing propensity in Canadian listed companies*, *International Journal of Managerial Finance*, 7(3).

- Carbo-Valverde S., Degryse H., Rodriguez-Fernandez F. (2011), *Lending Relationships and Credit Rationing: The Impact of Securitization*, Australasian Finance and Banking Conference.
- Chigurupati V.R., Hegde Sh.P. (2009), *Capital market frictions, Leasing and Investment*. Working Paper.
- Chu L., Mathieu R., Zhang P. (2008), *Why Firms Lease Short-Lived Assets: A Tax-Based Explanation*, Canadian Tax Journal.
- Cole R.A. (2011), *Bank Credit, Trade Credit or No Credit: Evidence from the Surveys of Small Business Finances*, <http://ssrn.com/abstract=1540221>.
- Cole R.A. (2008), *Who needs credit and who gets credit? Evidence from the Surveys of Small Business Finances*, <http://mpra.ub.uni-muenchen.de/24691/>, MPRA Paper No. 24691.
- Cole R.A., Dietrich A. (2012), *SME Credit Availability Around the World, Evidence from World Bank's Enterprise Survey*.
- Cook D.L. (1999), *Trade Credit and Bank Finance: Financing Small Firms in Russia*, Journal of Business Venturing, Vol.14.
- Coulibaly B., Saprizza H., Zlate A. (2012), *Financial Frictions, Trade Credit, and the 2008-09 Global Financial Crisis*, Board of Governors of the Federal Reserve System, International Finance Discussion Papers Number 1020.
- Coupey-Soubeyran J., Hericourt J. (2011), *The relationship between trade credit, bank credit and financial structure: from firm-level nonlinearities to financial development heterogeneity. A study on MENA firm-level data*, Documents de travail du Centre d'Economie de la Sorbonne.
- Danielson M.G., Scott J.A. (2004), *Bank Loan Availability and Trade Credit Demand*, The Financial Review 39(4), pp. 579-600.
- Delanny A.F., Weill L. (2004), *The Determinants of Trade Credit in Transition Countries*, Economics of Planning, 37(3-4), pp. 173-193.
- Deloof M., Lagaert I., Verschuere I. (2007), *Leases and debt: complements or substitutes? evidence from Belgian SMEs*, Journal of Small Business Management, Volume: 45 Issue 4, pp. 491-500.
- Demiroglu, C., James, C., Kizilaslan, A. (2012), *Bank lending standards and access to lines of credit*, Journal of Money, Credit and Banking, 44(6), pp. 1063-1089.
- Detragiache E. (1994), *Public versus private borrowing: a theory with implications for bankruptcy reform*, Journal of Financial Intermediation 3, pp. 327-354.
- Detragiache E., Tressel T., Gupta (2008), *Foreign Banks in Poor Countries: Theory and Evidence*, Journal of Finance, American Finance Association, 63(5), pp. 2123-2160.
- Dewaelheyns N., Van Hulle C. (2007), *Internal capital markets and capital structure: Bank versus internal debt*, Department of Accountancy, Finance and Insurance, Katholieke Universiteit Leuven.
- Duke J., Franz D., Herbert H., Toy D. (2002), *Firm-specific determinants of off-balance sheet leasing: A test of the Smith/Wakeman model*, Journal of Business and Management, 8(4), pp. 335.
- Egger M., Smith G.D., Schneider M., Minder C. (1997), *Bias in meta-analysis detected by a simple, graphical test*, Bmj, 315(7109), pp. 629-634.
- Eisfeldt A.L., Rampini A.A. (2009), *Leasing, Ability to Repossess, and Debt Capacity*, Review of Financial Studies, 22 (4): 1621-1657. doi: 10.1093/rfs/hhn026.
- Fatoki O., Odeyemi A. (2010), *The determinants of access to trade credit by new SMEs in South Africa*, African Journal of Business Management, 4(13), pp. 2763-2770.
- Filaretto-Deghay M., Severin E. (2007), *Determinants of the choice leasing vs bank loan: evidence from the French SME by KACM*, Revista Investigacion Operacional, 28(2), pp. 120-130.
- Finucane T.J. (1988), *Some empirical evidence on the use of financial leases*, The Journal of Financial research, XI(4).
- Franzen L.A., Rodgers K.J., Simin T.T. (2009), *Capital Structure and the Changing Role of Off-Balance-Sheet Lease Financing*, http://www.frbatlanta.org/filelegacydocs/seminars/seminar_simin_101609.pdf, 2009
- Garcia-Appendini E., Montoriol-Garriga J. (2011), *Firms as Liquidity Providers: Evidence from the 2007-2008 Financial Crisis*, Journal of Financial Economics, Vol. 109 No. 1
- Ge Y., Qiu J. (2007), *Financial development, bank discrimination and trade credit*, Journal of Banking and Finance, 31(2), pp. 513-530.
- Grinblatt M., Titman S. (1998), *Financial Markets and Corporate Strategy*, Irwin-McGraw-Hill.
- Ghosh S. (2010), *Firm Characteristics, Financial Composition and Response to Monetary Policy: Evidence from Indian Data*, Journal of Indian Business Research, 2(4), pp. 198-215.
- Ghosh S., Sensarma R. (2004), *Does monetary policy matter for corporate governance? Firm-level evidence from India*, w: M. Hirschey, J. Kose, A. Makhija (ed.), *Corporate Governance*, Advances in Financial Economics, Vol. 9., Emerald Group Publishing Limited, pp. 327-353.
- Goodacre A. (2003), *Operating lease finance in the UK retail sector*, The International Review of Retail, Distribution and Consumer Research.
- Graham J.R., Lemmon M.L., Schallheim J. S. (1998), *Debt, leases, taxes, and the endogeneity of corporate tax status*, The Journal of Finance, 53(1), pp. 131-162.
- Guariglia A., Mateut S. (2006), *Credit channel, trade credit channel, and inventory investment: Evidence from a panel of UK firms*, Journal of Banking and Finance, 30(10) pp. 2835-2856.
- Haan L., Sterken E. (2000), *Capital Structure, Corporate Governance, and Monetary Policy: Firm-Level Evidence for the Euro Area*, De Nederlandsche Bank, Research Memorandum WO&E No. 637/0032.
- Huang H. Shi X., Zhang S. (2011), *Counter-cyclical substitution between trade credit and bank credit*, Journal of Banking and Finance, 35, pp. 1859-1878.
- Hunter J.E., Schmidt F.L. (1990), *Methods of meta-analysis: Correcting error and bias in research findings*. Newbury Park: CA: Sage.

- Huyghebaert N. (2006), *On the Determinants and Dynamics of Trade Credit Use: Empirical Evidence from Business Start-ups*, Journal of Business Finance & Accounting, 33(1) & (2), pp. 305–328.
- Huyghebaert N., Van de Gucht L., Van Hulle C. (2007), *The Choice between Bank Debt and Trade Credit in Business Start-ups*, Small Business Economics, 29(4), pp. 435–452.
- Jiménez G., Ongena S., Peydró J., Saurina J. (2009), *Monetary Policy and Credit Crunch: Identifying Simultaneously the Bank Lending and Balance Sheet Channels*, <http://www.eea-esem.com/files/papers/EEA-ESEM/2009/1304/JOPS%20CC%202009-02-12.pdf>
- Jiménez G., Ongena S., Peydró J., Saurina J. (2010), *Credit supply identifying balance-sheet channel with loan applications and granted loans*, European Central Bank Working Paper Series, No. 1179 / April.
- Jiménez G., Ongena S., Peydró J., Saurina J. (2012), *Credit Supply versus Demand: Bank and Firm Balance-Sheet Channels in Good and Crisis Times*, European Banking Center Discussion Paper No. 2012-003.
- Jiménez G., Ongena S., Peydró J., Saurina J. (2013), *Monetary Policy and Credit Crunch: Identifying Simultaneously the Bank Lending and Balance Sheet Channels*, Bank of Spain mimeo.
- Kestens K., Van Cauwenberge P., Bauwhede H.V. (2012), *Trade credit and company performance during the 2008 financial crisis*, Accounting and Finance 52, pp. 1125–1151.
- Koh J., Jang S. (2009), *Determinants of using operating lease in the hotel industry*, International Journal of Hospitality Management, Vol. 28.
- Lasfer M.A., Levis M. (1998), *The Determinants of the Leasing Decision of Small and Large Companies*, European Financial Management, 4(2), pp. 159–184.
- Leeth J.D., Scott J.A. (1989), *The incidence of secured debt: evidence from the small business community*, Journal of Financial and Quantitative Analysis, 24(03), pp. 379–394.
- Lin J.R., Wang Ch.-J., Chou D.-W., Chueh F.-Ch. (2012), *Financial constraint and the choice between leasing and debt*, International Review of Economics & Finance, vol. 27, issue C, pp. 171–182.
- Love M., Peria M. (2012), *How Bank Competition Affects Firm's Access to Finance*, Midwest Finance Association 2013, Annual Meeting Paper, Available at SSRN: <http://ssrn.com/abstract=2144888>.
- Love I., Preve L.A., Sarria-Allende V. (2007), *Trade credit and bank credit: Evidence from recent financial crisis*, Journal of Financial Economics, 83.
- Marston F., Harris R.S. (1988), *Substitutability of leases and debt in corporate capital structures*, Journal of Accounting, Auditing and Finance, 3(2), pp. 147–164.
- Marzec J., Pawłowska M. (2011), *Racjonowanie kredytów a substytucja między kredytem kupieckim i bankowym – badania na przykładzie polskich przedsiębiorstw*, Materiały i Studia NBP, Zeszyt 261.
- Mateut S., Mizen P., Ziane Y. (2011), *No Going Back: The Interactions Between Processed Inventories and Trade Credit*, Centre for Finance and Credit Markets, Working Paper 11/04.
- Myers S. C., Majluf N. S. (1984), *Corporate financing and investment decisions when firms have information that investors do not have*, Journal of financial economics, 13(2), pp. 187–221.
- Neuberger D., Rätthke-Döppner S. (2013), *Leasing by small enterprises*, Applied Financial Economics, 23(7), pp. 535–549.
- Niskanen J., Niskanen M. (2006), *The Determinants of Corporate Trade Credit Policies in a Bank-dominated Financial Environment: the Case of Finnish Small Firms*, European Financial Management, 12(1).
- Ogawa K., Sterken E., Tokutsu I. (2011), *The trade credit channel revisited: evidence from micro data of Japanese small firms*, Small Business Economics, 40, pp. 101–118.
- Ono M. (2001), *Determinants of Trade Credit in the Japanese Manufacturing Sector*, Journal of the Japanese and International Economies, Vol. 15.
- Petersen M.A., Rajan R.G. (1997), *Trade Credit: Theories and Evidence*, The Review of Financial Studies, 10(3), pp. 661–691.
- Rauh J. D., Sufi A., *Explaining Corporate Capital Structure: Product Markets, Leases, and Asset Similarity*, SSRN: <http://ssrn.com/abstract=1592463>, 2010
- Robicheaux S.H., Fu X., Ligon J.A. (2008), *Lease Financing and Corporate Governance*, Financial Review, 43(3), pp. 403–437.
- Rosenthal R., Rubin B.D. (1982), *Comparing effect sizes in independent studies*, Psychological Bulletin, 92, pp. 500–504.
- Sauerbrei W., Blettner, M. (2003), *Issues of traditional reviews and meta-analyses of observational studies in medical research. Meta-Analysis New Developments and Applications in Medical and Social Sciences*, Cambridge, MA: Hogrefe and Huber, pp. 78–98.
- Schallheim J., Wells K., Whitby R. (2013), *Do Leases Expand Debt Capacity?*, Journal of Corporate Finance, Volume 23, pp. 368–381.
- Sharpe S.A., Nguyen H.H. (1995), *Capital market imperfections and the incentive to lease*, Journal of Financial Economics, 39(2), pp. 271–294.
- Singh A. (2011), *An empirical investigation of the lease-debt relation in the restaurant and retail industry*, International CHRIE Conference-Refereed Track.
- Singh A. (2013), *Is Leasing a Substitute or Complement to Debt? Evidence from the Restaurant and Retail Industry*, Journal of Hospitality & Tourism Research, 37(2), pp. 155–183.
- Slotty C. (2009), *Financial constraints and the decision to lease: Evidence from German SME*, Johann-Wolfgang-Goethe-Universität Frankfurt am Main, Fachbereich Wirtschaftswissenschaften Finance and accounting, No. 205.
- Stanley T. (2005), *Beyond Publication Selection*, Journal of Economic Surveys, 19, pp. 309–345.

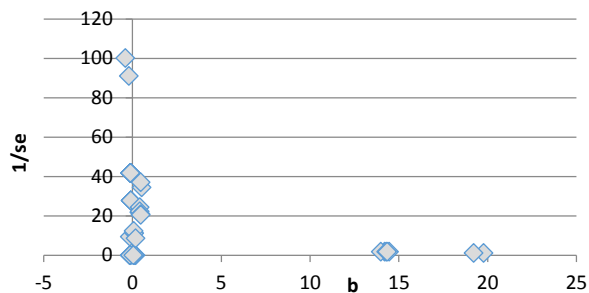
- Stanley T. (2008), *Meta-regression methods for detecting and estimating empirical effect in the presence of publication bias*. Oxford Bulletin of Economics and Statistics, 70, pp. 103-127.
- Stanley T.D., Jarrell S.B., *Meta-regression analysis: A quantitative method of literature surveys*, Journal of Economic Surveys, 1989, 3, pp. 161-170.
- Taketa K., Udell G. F. (2007), *Lending Channels and Financial Shocks: The Case of Small and Medium-Sized Enterprise Trade Credit and the Japanese Banking Crisis*, Monetary and Economic Studies, 25(2), pp. 1-44.
- Uesugi I., Yamashiro G.M. (2008), *The Relationship between Trade Credit and Loans: Evidence from Small Businesses in Japan*, International Journal of Business, 13(2).
- Vaidya R. (2011), *The Determinants of Trade Credit: Evidence from Indian Manufacturing Firms*, Modern Economy, Vol. 2.
- Yan A. (2006), *Leasing and Debt Financing: Substitutes or Complements?* The Journal of Financial and Quantitative Analysis, 41(03), pp. 709-731.
- Zawadzka D. (2009), *Determinanty popytu małych przedsiębiorstw na kredyt handlowy*, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań.

Chart 1. Profitability: relation between the parameter estimation and the inverse of the standard deviation.



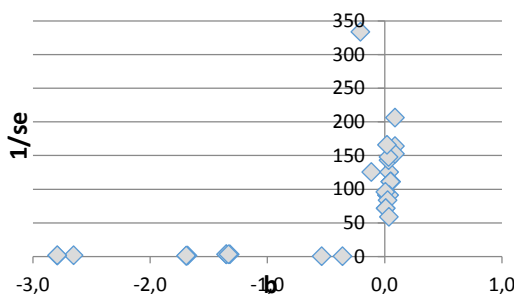
Source: own study based on the review of empirical literature.

Chart 3. Assets structure: relation between the parameter estimation and the inverse of the standard deviation.



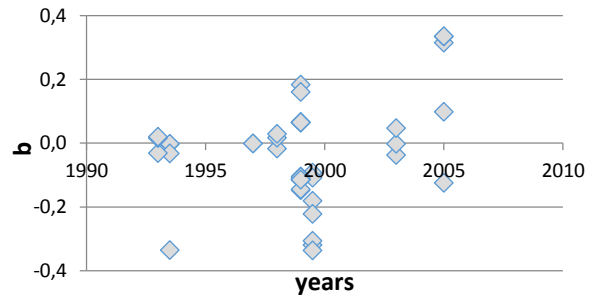
Source: own study based on the review of empirical literature.

Chart 5. Company size: relation between the parameter estimation and the inverse of the standard deviation.



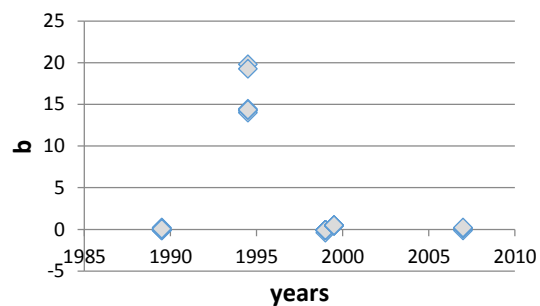
Source: own study based on the review of empirical literature.

Chart 2. Profitability: change of estimated values in time.



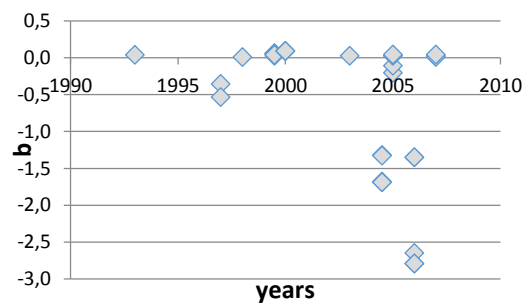
Source: own study based on the review of empirical literature.

Chart 4. Assets structure: change of estimated values in time.



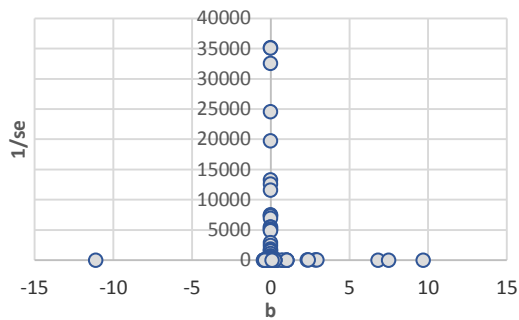
Source: own study based on the review of empirical literature.

Chart 6. Company size: change of estimated values in time.



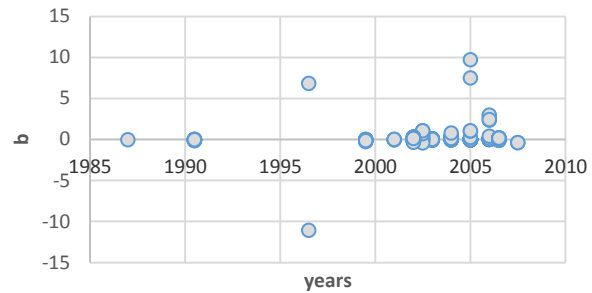
Source: own study based on the review of empirical literature.

Chart 7. Indebtedness: relation between the parameter estimation and the inverse of the standard deviation.



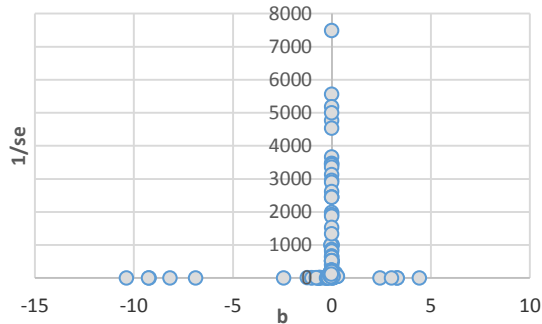
Source: own study based on the review of empirical literature.

Chart 8. Indebtedness: change of estimated values in time.



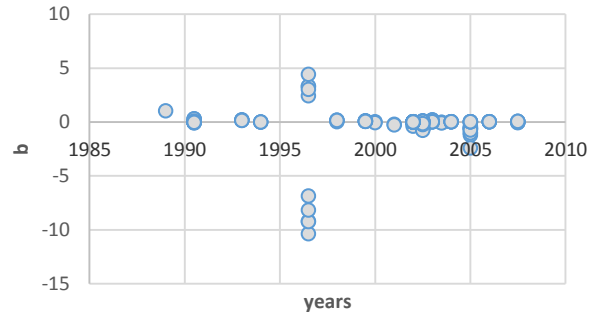
Source: own study based on the review of empirical literature.

Chart 9. Liquidity: relation between the parameter estimation and the inverse of the standard deviation.



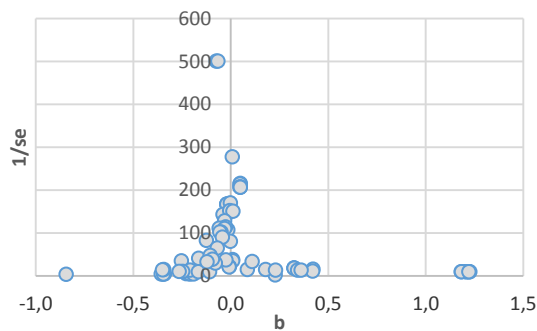
Source: own study based on the review of empirical literature.

Chart 10. Liquidity: change of estimated values in time.



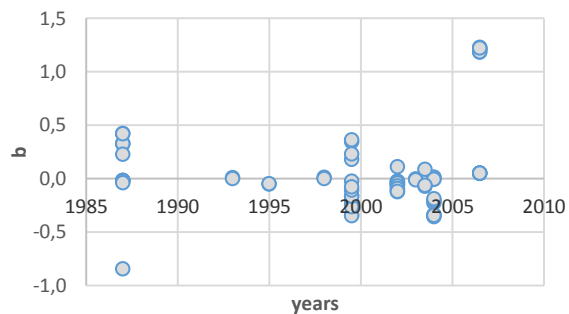
Source: own study based on the review of empirical literature.

Chart 11. Profitability: relation between the parameter estimation and the inverse of the standard deviation.



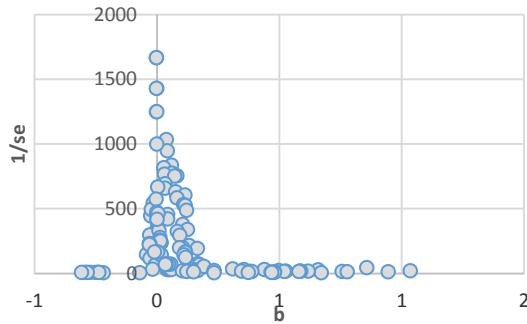
Source: own study based on the review of empirical literature.

Chart 12. Profitability: change of estimated values in time.



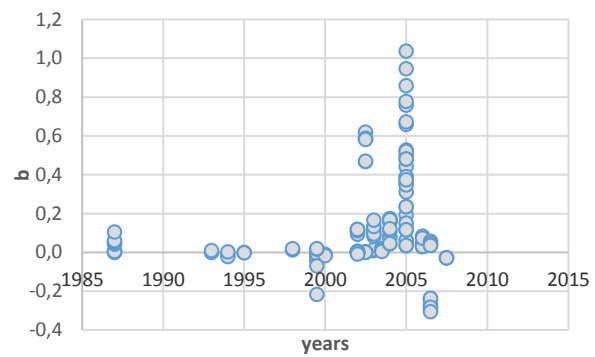
Source: own study based on the review of empirical literature.

Chart 13. Size: relation between the parameter estimation and the inverse of the standard deviation.



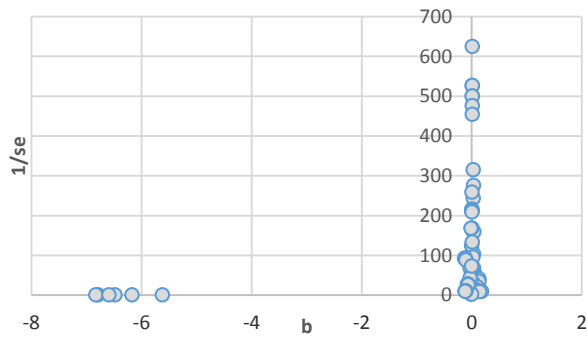
Source: own study based on the review of empirical literature.

Chart 14. Size: change of estimated values in time.



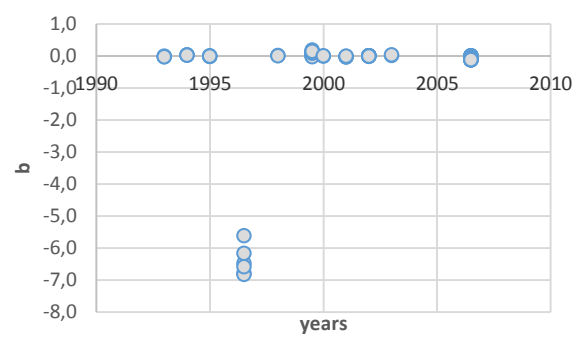
Source: own study based on the review of empirical literature.

Chart 15. Development: relation between the parameter estimation and the inverse of the standard deviation.



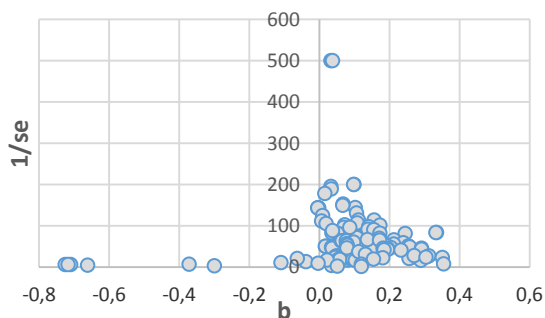
Source: own study based on the review of empirical literature.

Chart 16. Development: change of estimated values in time.



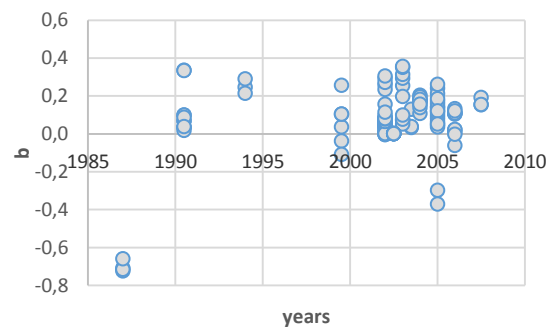
Source: own study based on the review of empirical literature.

Chart 17. Stock: relation between the parameter estimation and the inverse of the standard deviation.



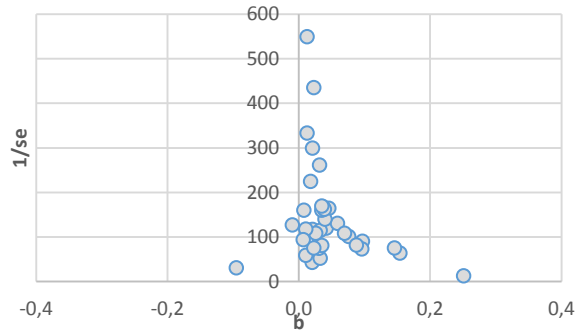
Source: own study based on the review of empirical literature.

Chart 18. Stock: change of estimated values in time.



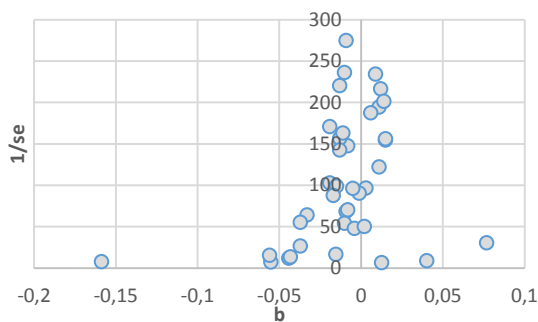
Source: own study based on the review of empirical literature.

Chart 19. Indebtedness: relation between the parameter estimation and the inverse of the standard deviation.



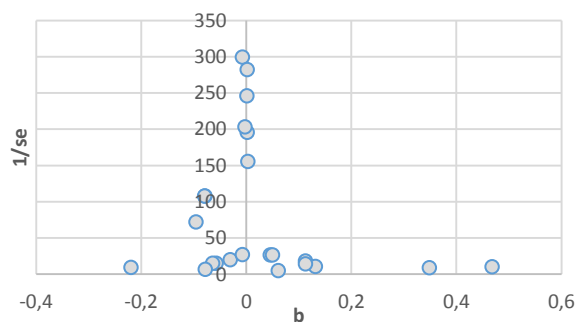
Source: own study based on the review of empirical literature.

Chart 21. Liquidity: relation between the parameter estimation and the inverse of the standard deviation.



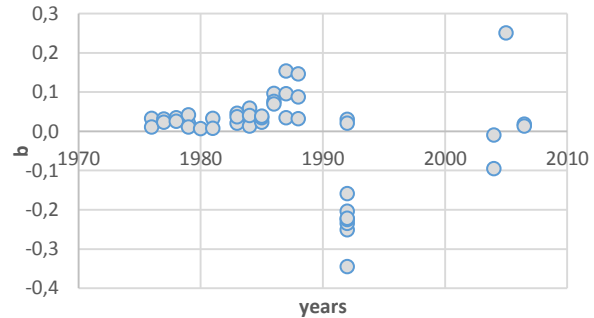
Source: own study based on the review of empirical literature.

Chart 23. Tax: relation between the parameter estimation and the inverse of the standard deviation.



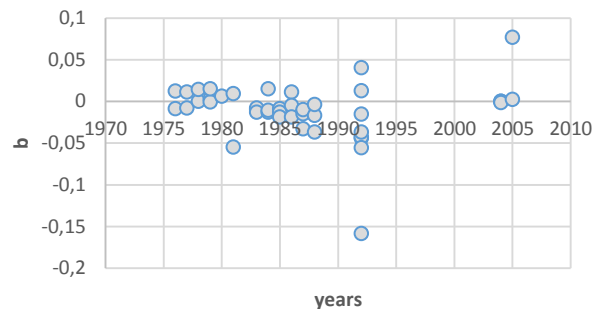
Source: own study based on the review of empirical literature.

Chart 20. Indebtedness: change of estimated values in time.



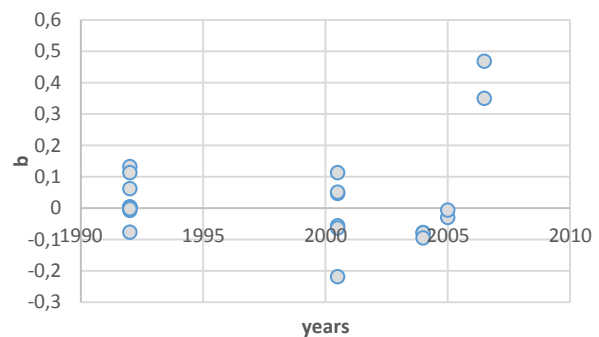
Source: own study based on the review of empirical literature.

Chart 22. Liquidity: change of estimated values in time.



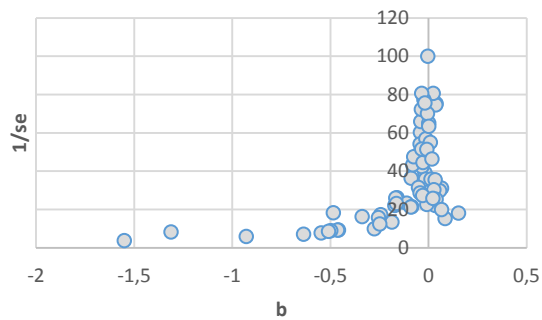
Source: own study based on the review of empirical literature.

Chart 24. Tax: change of estimated values in time.



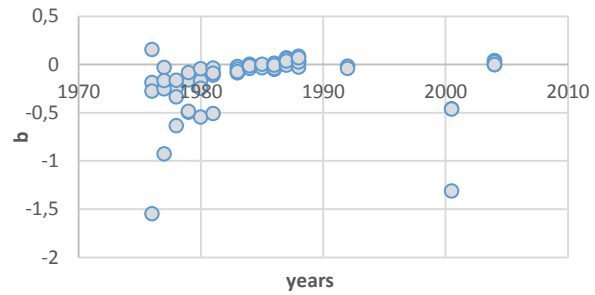
Source: own study based on the review of empirical literature.

Chart 25. Profitability: relation between the parameter estimation and the inverse of the standard deviation.



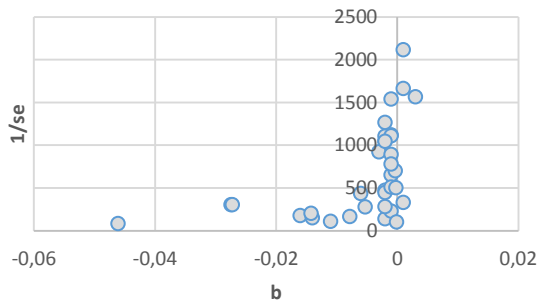
Source: own study based on the review of empirical literature.

Chart 26. Profitability: change of estimated values in time.



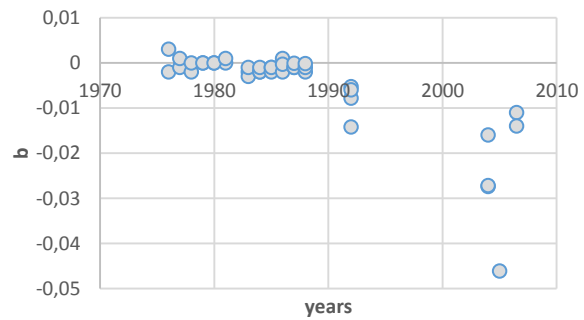
Source: own study based on the review of empirical studies.

Chart 27. Size: relation between the parameter estimation and the inverse of the standard deviation.



Source: own study based on the review of empirical literature.

Chart 28. Size: change of estimated values in time.



Source: own study based on the review of empirical literature.

Table 1. List of articles included in the last phase of the meta-analysis

Authors	Years of research	Country	Publications	# regressions
Alonso et al. (2005)	1991-1996	Spain	The Financial Review, Eastern Finance Association	4
Boguszewski,Kocięcki (2000)	1994	Poland	Bank i Kredyt	2
Bougheas et al. (2004)		Great Britain	The Central Bank of the Republic of Turkey	7
Brown et al. (2010)	2003-2007	Bulgaria	Swiss National Bank	3
Cole (2011)	1993, 1998, 2003	USA	MPRA Paper	6
Cole (2008)	1993, 1998, 2003	USA	MPRA Paper	9
Cole, Dietrich (2012)	2006-2011	80 countries	World Bank's Enterprise Survey	3
Cook (1999)	1995	Russia	Journal of Business Venturing	5
Demiroglu et al. (2012)	1996-2004		Journal of Monetary, Credit and Banking	3
Dewaelheyns, Van Hulle (2007)	1997-2001	Belgium	Katholieke Universiteit Leuven	7
Ghosh, Sensarma (2004)	1992-2002	India	Advances in Financial Economics	2
de Haan, Sterken (2000)	1990-1997	EU, Great Britain	De Nederlandsche Bank, Research Memorandum WO&E	12
Huyghebaert et al. (2007)	1988-1991	Belgium	Small Business Economics	8
Jiménez et al. (2010)	2002-2008	Spain	European Central Bank Working Paper Series	7
Jiménez et al. (2012)	2002-2010	Spain	European Banking Center Discussion Paper	10
Jiménez et al. (2009)	1992-2006	Spain	Bank of Spain mimeo	16
Love, Peria (2012)	2002-2010	80 countries	Midwest Finance Association	15

Source: own study based on the review of empirical literature.

Table 2. Collective results for the effect of the selected determinants of bank loan financing

Group	Variable	The direction of impact	# regressions
Profitability	ROA = Net Income / Total Assets	+	11
		-	20
		Not significant	11
Tangibility	Fixed Assets / Total Assets	+	14
		-	15
		Not significant	12
Size	Logarithm of Total Assets	+	17
		-	12
		Not significant	5

Source: own study based on the review of empirical literature.

Table 3. Linear regression results for (I) profitability, (II) assets structure, (III) company size

Variables	I profitability b (se)		II assets structure b (se)		III company size b (se)	
	Publication selection bias	Publication selection bias + heterogeneity	Publication selection bias	Publication selection bias + heterogeneity	Publication selection bias	Publication selection bias + heterogeneity
1/se	-0,0017 (0,0022)	-0,0012 (0,021)	-0,5134*** (0,0597)	-0,4767*** (0,0389)	-0,0493## (0,0324)	-0,2489*** (0,0235)
constant	-0,2780 (0,6375)	-8149,9*** (2261,8)	18,4722*** (2,1391)	24320,2*** (2833,8)	4,0116 (3,6999)	43807,1*** (8900,8)
year of publication		4,0348*** (1,1229)		-12,0822*** (1,4092)		-21,77783 *** (4,4279)
working paper				-5,2098*** (1,8250)		-19,0946 * (9,2965)
continuous dependent variable		6,5378*** (1,4375)				
firms listed on the stock exchange		32,9687*** (9,2008)				
capital groups		6,3077** (2,5667)		-15,0200*** (2,3205)		
new data (average year >2005)		3,861714** (1,6648)				
logarithm of the number of observations		3,3104*** (0,9777)				

Source: own study based on the review of empirical literature.

Table 4. List of articles included in the last phase of the meta-analysis

Authors	Years of research	Country	Publications	# regressions
Atanasova (2007)	1981-2000	Great Britain	Financial Management	11
Atanasova, Wilson (2003)	1989-1999	Great Britain	Managerial & Decision Economics	3
Bougheas et al. (2009)	1996-2003	Great Britain	Journal of Banking & Finance	8
Carbó-Valverde et al. (2012)	1994-2008	Spain	Central Bank of Ireland	4
Cole (2011)	1993, 1998, 2003	USA	SSRN working paper: http://ssrn.com/abstract=1540221	6
Coulibaly et al. (2012)		China , India , Indonesia , Malaysia , Taiwan , Thailand	International Finance Discussion Papers	5
Coupepy-Soubeyran, Hericourt (2011)	2000-2004	Egypt, Lebanon, Morocco	Documents de travail du Centre d'Economie de la Sorbonne	21
Danielson, Scott (2004)	1995	USA	The Financial Review	2
Delanny, Weill (2004)	1999-2000	Bulgaria, the Czech Republic, Estonia , Hungary , Latvia, Lithuania , Poland , Romania , Slovakia	Economics of Planning	18
Fatoki, Odeyemi (2010)		Africa	African Journal of Business Management	1
Garcia-Appendini, Montoriol-Garriga (2012)	2005-2008		Journal of Financial Economics	13
Ge, Qiu (2007)	2000	China	Journal of Banking & Finance	6
Huang et al. (2011)	1998-2006	China	Journal of Banking & Finance	13
Huyghebaert (2006)	1992-2002	Belgium	Journal of Business Finance & Accounting	10
Kestens et al. (2012)	2006-2009	Belgium	Accounting and Finance	12
Love et al. (2007)	1994-1999	Indonesia , Korea, Malaysia , Mexico , the Philippines, Thailand	Journal of Financial Economics	36
Marzec, Pawłowska (2011)	2001-2009	Poland	Materiały i Studia	12
Mateut et al. (2011)	2000-2007	France	Centre for finance and credit markets working paper	9
Niskanen, Niskanen (2006)	1994-1996	Finland	European Financial Management	6
Ogawa et al. (2011)	2004	Japon	Small Business Economics	12
Petersen, Rajan (1997)	1987	USA	The Review of Financial Studies	10
Taketa., Udell (2007)	1974-2004	Japon	Monetary and Economic Studies	18
Uesugi, Yamashiro (2008)	2002-2003	Japon	International Journal of Business	8
Vaidya (2011)	1993-2006	India	Indira Gandhi Institute of Development Research	4
Zawadzka (2009)	2002 - 2006	Poland	Wydawnictwo UE w Poznaniu	55

Source: own study based on the review of empirical literature.

Table 5. Collective results for the effect of the selected determinants of trade credit financing

Group	Variable	The direction of impact	# regressions
Indebtedness	Debt / Total Assets	+	78
		-	66
		Not significant	86
Liquidity	Cash flow / Total Assets	+	46
		-	57
		Non linear	2
		Not significant	70
Size	Logarithm of Total Assets	+	97
		-	22
		Non linear	2
		Not significant	36
Profitability	Net Income / Total Assets	+	24
		-	41
		Not significant	20
Inventory	Inventory / Total Assets	+	92
		-	23
		Not significant	43
Growth opportunities	Growth Sales	+	34
		-	19
		Not significant	36

Source: own study based on the review of empirical literature.

Table 6. Results of linear regression for (I) indebtedness, (II) liquidity, (III) profitability, (IV) size, (V) growth opportunities, (VI) inventory

Variables	I indebtedness b (se)	II liquidity b (se)	III profitability b (se)	IV size b (se)	V growth opportunities b (se)	VI inventory b (se)
Publication selection bias						
1/se	-0,0001 (0,0003)	0,0008* (0,0005)	-0,0407*** (0,0082)	0,0118*** (0,0040)	0,0141*** (0,0028)	0,0411*** (0,0072)
constant	2.5034* (1.5008)	-0,2240 (0,6928)	2,8002*** (1,0299)	7,0742*** (1,8346)	-1,2232** (0,5211)	3,5615*** (0,7260)
Publication selection bias + heterogeneity						
1/se	-0,0002 (0,0003)	0,0002 (0,0004)	-0,0668*** (0,0045)	0,0187*** (0,0108)	0,0484*** (0,0073)	0,0441*** (0,0067)
constant	-2370,8*** (746,6)	4,2151 (1,9956)	-1058,2*** (116,3)	-4695,7 (3952,1)	2522,6*** (528,7)	-6,7657 (7,1333)
average year	1,1851** (0,3738)			5,4082** (2,6999)		
new data (average year >2005)		-5,9713*** (1,9452)		-9,4854* (5,6372)		-2,3054** (0,9467)
year of publication			0,5176 *** (0,0588)	-3,0564* (1,8662)	-1,24848*** (0,26310)	
working paper			-20,0780*** (1,7792)			-6,6825*** (2,1957)

logarithm of the number of observations			4,0517*** (0,5106)	2,7239** (1,0770)	-3,2716*** (0,4352)	0,94667* (0,7900)
continuous dependent variable						4,2074** (1,7211)

Source: own study based on the review of empirical literature.

Table 7. List of articles included in the last phase of the meta-analysis

Authors	Years of research	Country	Publications	# regressions
Ang, Peterson (1984)	1966-1981	USA	The Journal of Finance	12
Beattie et al. (2000)	1990-1994	Great Britain	Journal of Banking and Finance	11
Beatty et al. (2010)	1995-2006	USA	The Accounting Review	7
Branson (1995)	1983-1988	USA	Quarterly Journal of Business and Economics	36
Callimaci et al. (2011)	2006-2007	Canada	International Journal of Managerial Finance	6
Chigurupati, Hegde (2009)	1995-2006	USA	SSRN Electronic Journal	7
Chu et al. (2008)	2005	Canada	Canadian Tax Journal	2
Deloof et al. (2007)	1994-1999	Belgium	Journal of Small Business Management	13
Duke et al. (2002)	1985	USA	Journal of Business and Management	5
Eisfeldt, Rampini (2009)	2002	USA	Review of Financial Studies	4
Filaretto-Deghayé, Séverin (2007)	1999	France	Revista Investigacion Operacional	1
Finucane (1988)	1981-1985	USA	The Journal of Financial Research	6
Franzen et al. (2009)	1980-2007	USA	http://www.frbatlanta.org/filelegacydocs/seminars/seminar_simin_101609.pdf	6
Goodacre (2003)	1999	Great Britain	The International Review of Retail, Distribution and Consumer Research	1
Koh, Jang (2009)	1995-2004	USA	International Journal of Hospitality Management	1
Lasfer, Levis (1998)	1982-1996	Great Britain	European Financial Management	9
Lin et al. (2012)	1991-2005	USA	International Review of Economics & Finance	5
Marston, Harris (1988)	1974-1982	USA	Journal of Accounting, Auditing and Finance	14
Rauh, Sufi (2010)	2008	USA	SSRN Electronic Journal	29
Robicheaux et al. (2008)	1992	USA	Financial Review	6
Schallheim et al. (2013)	1980-2011	USA	Journal of Corporate Finance	15
Singh (2011)	2006-2008	USA	International CHRIE Conference-Refereed Track	12
Singh (2013)	2006-2008	USA	Journal of Hospitality and Tourism Research	12
Slotty (2009)	2002-2006	German	Universität Frankfurt am Main	3
Yan (2006)	1983-1997	USA	The Journal of Financial and Quantitative Analysis	4

Source: own study based on the review of empirical literature.

Table 8. Collective results for the effect of the selected determinants of lease financing

Group	Variable	The direction of impact	# regressions
Indebtedness	Debt / Total Assets	+	28
		-	8
		Not significant	9
Liquidity	Cash flow / Total Assets	+	6
		-	11
		Not significant	34
Tax	Tax / Net Income	+	2
		-	10
		Non linear	11
		Not significant	35
Profitability	Net Income / Total Assets	+	5
		-	30
		Not significant	43
Size	Logarithm of Total Assets	+	6
		-	5
		Not significant	19

Source: own study based on the review of empirical literature.

Table 9. Results of linear regression for (I) indebtedness, (II) liquidity, (III) tax, (IV) profitability, (V) size

Variables	I indebtedness b (se)	II liquidity b (se)	III tax b (se)	IV profitability b (se)	V size b (se)
Publication selection bias					
1/se	0,0109** (0,0047)	0,0013 (0,0035)	-0,0064 (0,0072)	0,0493*** (0,0126)	0,0018*** (0,0001)
constant	3,1292*** (0,8430)	-0,4958 (0,4507)	-0,0828 (0,9081)	-3,5401*** (0,5420)	-2,6096*** (0,6083)
Publication selection bias + heterogeneity					
1/se	0,0034 (0,0025)	-0,0028 (0,0039)	-0,0026 (0,0041)	-0,0122 (0,0132)	0,0002 (0,0006)
constant	-1014,5*** (153,5)	164,6*** (68,9)	-3395,0*** (901,0)	-590,5*** (105,4)	232,1*** (74,7)
year of publication	0,2236** (0,1079)	-0,0869** (0,0348)	1,6913*** (0,4497)	0,3011*** (0,0534)	-0,1168*** (0,0373)
working paper	-11,3881** (4,5761)			-10,8506*** (1,6680)	-3,9434*** (0,9892)
firms listed on the stock exchange	-11,5845*** (1,3589)			-4,9009*** (1,5616)	
average year	0,2956** (0,1423)				
logarithm of the number of observations	-1,8721* (1,0144)	1,3719* (0,9554)	-1,0721** (0,3818)		

Source: own study based on the review of empirical literature.

Table 10. Potential Explanatory Variables for Meta-Regression Analysis

Variables	Definition
year of publication	continuous variable, year when an article was published
working paper	binary variable, 1 – research is a working paper, 0 - other
continuous dependent variable	binary variable, 1 - dependent variable is a continuous variable, 0 -other
firms listed on the stock exchange	binary variable, 1 - firms listed on the stock exchange are investigated, 0 - other
capital groups	binary variable, 1 – capital groups are investigated, 0 - other
new data (average year >2005)	binary variable, 1 – research is based on new data, average year is larger than 2005, 0 - other
logarithm of the number of observations	continuous variable, logarithm of the number of observations



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